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TITLE: Textural dividing method for
color document can separate
a figure from text part in a
color document or an
advertisement brochure for
subsequent processing
according to different data
characteristics

INVENTOR: JIUH, J; LIN, W ; WU, B

PRIORITY-DATA: 1998TW-0115124 (September 11, 1998)

PATENT-FAMILY:

PUB-NO		PUB-DATE
LANGUAGE	PAGES	MAIN-IPC
TW 376670 A		December 11, 1999
N/A	018	H04N 009/78

INT-CL (IPC): H04N009/78

ABSTRACTED-PUB-NO: TW 376670A

BASIC-ABSTRACT:

The textural dividing method for a color document
can separate a figure from
text part in a color document or an advertisement
brochure for subsequent
processing according to different data
characteristics. The techniques used

involves: (a) searching for figure and text blocks;
(b) extracting three
characteristic parameters of the number of colors,
projection histogram, and
fractal dimension in the image; (c) using fuzzy
rules to obtain the attribute
function of the three parameters obtained in step
(b) and fuzzifying the
attribute function, and defuzzifying the result by
built-in fuzzy rules thereby
separating the figure part from the text part in
the image to complete the
textural division of the image data.

----- KWIC -----

Basic Abstract Text - ABTX (1):

The textural dividing method for a color
document can separate a figure from
text part in a color document or an advertisement
brochure for subsequent
processing according to different data
characteristics. The techniques used
involves: (a) searching for figure and text blocks;
(b) extracting three
characteristic parameters of the number of colors,
projection histogram, and
fractal dimension in the image; (c) using fuzzy
rules to obtain the attribute
function of the three parameters obtained in step
(b) and fuzzifying the
attribute function, and defuzzifying the result by
built-in fuzzy rules thereby
separating the figure part from the text part in
the image to complete the
textural division of the image data.

graphically in the scatter plots of pixel data shown in FIGS. 3A and 3B. A scatter plot of raw pixel data usually shows that pixel intensities do not span the entire range of the red, green, and blue color palette which can be displayed on a standard color monitor 20 or printer 18. Even after conventional histogram equalization of each color plane separately, the scatter plot in three dimensions may appear as shown in FIG. 3A. In this figure, there is a high correlation among the three colors. The pixel concentration is along the main diagonal of the RGB color cube or M-dimensional display space, and each point is represented as a shade of gray but with a tinge of color. For purposes of contrast enhancement, it would be desirable to spread these pixels away from the main diagonal to make better use of the full range of colors which can be displayed. If the pixel distribution in FIG. 3A were spread out to the distribution of FIG. 3B, for example, subtle differences of color would be exaggerated into larger differences of color which would make them easier to discern. There are several ways to accomplish this, which illustratively include: using neural networks, such as an input trained general regression neural network (IT-GRNN), an input trained back-propagation neural network (IT-BPNN), and an auto associative neural network (AANN); using fuzzy logic to describe how each pixel value should be changed iteratively to spread the scatter plot; using Kohonen self organizing maps; and perpendicular expansion

to name a few.

PAT-NO: JP02002042055A

DOCUMENT-IDENTIFIER: JP 2002042055 A

TITLE: METHOD FOR CHARACTER
EXTRACTION FROM COLOR DOCUMENT
IMAGE

PUBN-DATE: February 8, 2002

INVENTOR-INFORMATION:

NAME

COUNTRY

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N/A

ASSIGNEE-INFORMATION:

NAME

COUNTRY

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APPL-NO: JP2000222063

APPL-DATE: July 24, 2000

INT-CL (IPC): G06K009/20, G06T001/00 , G06T005/00
, G06T007/00 , H04N001/60
, H04N001/40 , H04N001/46

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for
character extraction from

color document image that can separate the background color and the character color of an image and extract characters even from a complex and varied background by clustering the color information.

SOLUTION: The method for character extraction from color document image, which extracts only character color portions from a color document image with a complex and varied background, removes dithers by smoothing from the color document image, converts the color values of the dither-removed image from the RGB system to the L*u*v* system and prepares a histogram thereof, clusters the color information on a fuzzy basis, prepares color-separated images (binary images) according to the degree of assignment, removes noise from the binary images, provides labels to black pixels and white pixels, then selects a binary image suitable for character extraction, and extracts a line of characters.

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US-PAT-NO: 5489997

DOCUMENT-IDENTIFIER: US 5489997 A

TITLE: Color image processing
apparatus

DATE-ISSUED: February 6, 1996

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	CITY
Usami; Akihiro			Yokohama
	N/A	N/A	JP

APPL-NO: 07/ 797967

DATE FILED: November 26, 1991

FOREIGN-APPL-PRIORITY-DATA:		
COUNTRY	APPL-NO	
APPL-DATE		
JP	2-326457	November
27, 1990		
JP	3-307799	November
22, 1991		

US-CL-CURRENT: 358/522, 358/487 , 358/501 ,
358/506 , 358/518 , 358/523
, 358/524

ABSTRACT:

A color image processing apparatus includes a storage device for storing input image data for one frame and a discriminator for analyzing the color image data stored in the storage device. In the

color image processing
apparatus, the discriminator discriminates the type
of the stored color image
data utilizing a membership function.

22 Claims, 19 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

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Detailed Description Text - DETX (6):

In this embodiment, histograms of the
above-mentioned divisional color
spaces are formed so as to deduce the type of an
image stored in the memory 1.

In this embodiment, the following fuzzy deducing
rules are prepared.

US-PAT-NO: 6639998

DOCUMENT-IDENTIFIER: US 6639998 B1

TITLE: Method of detecting a
specific object in an image signal

DATE-ISSUED: October 28, 2003

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	COUNTRY	CITY
Lee; Jin Soo	N/A	N/A	KR	Seoul
Kim; Hycon Jun	N/A	N/A	KR	Kyonggi-do

APPL-NO: 09/ 480111

DATE FILED: January 10, 2000

COUNTRY	APPL-DATE	FOREIGN-APPL-PRIORITY-DATA: APPL-NO
KR	11, 1999	1999/425 January
KR	22, 1999	1999/2016 January
KR	9, 1999	1999/4358 February

US-CL-CURRENT: 382/103, 382/165 , 382/190 ,
382/209

ABSTRACT:

A method of detecting a specific object in an
image signal both efficiently

and accurately is disclosed. According to the present invention, an object is first detected from an image or frame using a general feature of the object and in the following image or frame, the object is detected using an object-dependent feature. Also, when detecting a plurality of objects or portions of the object, a full color range of the specific object is determined, and color range sections of the full color range is used to detect the object.

30 Claims, 33 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 16

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Detailed Description Text - DETX (36):

In another embodiment of the present invention, color is extensively utilized to detect an object. A typical application field for specifying a color range of the specific object to be detected is in the field for searching a face or hand by specifying the skin color. In the related art, a method specifies a skin color region by converting the color space of RGB into a color space of YIQ and detects the region of hand accordingly. Another method in the related art converts the skin color range in L*a*b color space using the principle component analysis and detects the skin color region using the

converted skin color range. Still, another method in the related art calculates the possibility that a specific color is the skin color using a fuzzy set.

Detailed Description Text - DETX (38):

FIG. 10 is a flowchart of an object detection process according to a third embodiment of the present invention. Referring to FIG. 10, when detecting the specific object from an input image frame, the detection system divides the full color range (W) of an object to be detected into a plurality of sections, R1 to R6 as shown in FIG. 9 (step ST101). The system obtains a color image by detecting colors of the input frame which satisfies a color range condition of the first color bin R1, i.e. a I-th color bin (steps ST102 and ST103). Thereafter, the detection system detects the object from the obtained color image and confirms the object using a general confirmation algorithm (step ST104). The detection system then compares and identifies whether the current section is the last color bin, i.e. section R6 (step ST105). If the current section level is the last level, the detection system terminates the process. Otherwise, the detection system increases a count value and returns to step ST103 (step ST106).

Detailed Description Text - DETX (40):

Furthermore, in the above embodiment, the full color range was divided into

six color bins R1 to R6 as shown in FIG. 9. However, the full color range may be divided into more or less color bins as necessary. Also, a brightness component is used as the basis for dividing the full color range (W). Accordingly, when detecting the face region by using the color of the face region, the relative brightness of the skin color can be considered, and the accurate and effective detection of the object region is possible.

US-PAT-NO: 5652881

DOCUMENT-IDENTIFIER: US 5652881 A

TITLE: Still picture
search/retrieval method carried out on the
basis of color information
and system for carrying out
the same

DATE-ISSUED: July 29, 1997

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	COUNTRY	CITY
Takahashi; Masamitsu	N/A	N/A	JP	Hadano
Yanagi; Kunihiro	N/A	N/A	JP	Sagamihara
Iwai; Noriyuki	N/A	N/A	JP	Yokohama

APPL-NO: 08/ 346301

DATE FILED: November 23, 1994

FOREIGN-APPL-PRIORITY-DATA:
COUNTRY APPL-NO

JP	5-293426	November
24, 1993		

US-CL-CURRENT: 707/104.1, 358/403 , 382/162 ,
382/165 , 382/181 , 382/305
, 707/3 , 707/5

ABSTRACT:

Still picture search/retrieval method and system for retrieving a still picture without omission by extracting representative color component from a location of the still picture which includes a thing for search. A search condition input processing module receives color information constituting a search condition via an input unit. A still picture dividing method determination processing module receives via the input unit a method for dividing the still picture into rectangular meshes of a same size. A divided mesh designation processing module receives designation of a mesh for search from those resulting from the division. Still picture information is read out from a database for dividing each still picture into meshes by a still picture division processing module. A representative color component extraction processing module extracts a color component having the highest frequency of histogram within the search-destined mesh. A search execution processing module evaluates the representative color component to determine an evaluation value. A still picture having the evaluation value exceeding a threshold value is retrieved as the search result. The retrieved still picture is displayed on a display unit through a searched still picture display processing module.

11 Claims, 33 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 20

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Claims Text - CLTX (72):

a memory including an area for storing color gradation division numbers, a table for storing representative gradation values for said color gradation divisions, respectively, a fuzzy flag area having a flag indicating whether or not a fuzzy influence is to be employed in executing the search for the purpose of enabling still pictures of colors approximating the designated color to be retrieved, a table for storing fuzzy grades of inputted color components, respectively, when said fuzzy inference is to be employed for the search, a table for storing inputted gradation values serving as the representative color components when said fuzzy inference is not employed in the search, a still picture division information storing table for storing divisors for dividing the still picture in the vertical (heightwise) direction and in the horizontal (widthwise) direction, respectively, an area for storing locations of the designated regions in terms of identifier numbers, respectively, a table for storing the gradation values at starting points and end points of several ranges into which the color component gradation is to be divided, an evaluation table for storing Cartesian products of fuzzy sets inputted, a still picture information table for storing file names of still pictures extracted from a database, a search-destined mesh picture

information table for storing still picture data of the search-destined meshes cut out from said still picture data, a frequency table for storing values of **histogram**, an area for storing an evaluation value corresponding to the representative **color** component value read out from said evaluation table, an area for storing a threshold value serving as a reference value for the search and determined previously in said system, and a search result table for storing results of the search; and

US-PAT-NO: 5652831

DOCUMENT-IDENTIFIER: US 5652831 A

TITLE: Variable point interpolation
apparatus and method with
scalable architecture for
color correction

DATE-ISSUED: July 29, 1997

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	COUNTRY	CITY
Huang; King-Lung	N/A	N/A	TW	Hsinchu Hsien
Chen; Henry	N/A	N/A	TW	Hsinchu Hsien

APPL-NO: 08/ 595557

DATE FILED: February 1, 1996

US-CL-CURRENT: 345/604

ABSTRACT:

A variable point interpolation apparatus with
scalable architecture for
color correction and a method of the same are
disclosed. The color correction
apparatus is capable of transforming color image
data from a first color space
to a second color space and comprises: an
appearance equivalent scalable
computing means for analyzing the color
characteristic of the image data from

the first color space and dividing an interpolation input signal of the image data into upper bits and lower bits in which numbers of the upper bits and the lower bits are adjustable; a fuzzy variable point interpolation computing means for determining automatically a proper number of interpolation reference points; a non-uniform three-dimensional look-up table, wherein variations of distances between any two reference values of knot points in the non-uniform three-dimensional look-up table are non-uniform.

18 Claims, 13 Drawing figures

Exemplary Claim Number: 7

Number of Drawing Sheets: 8

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Abstract Text - ABTX (1):

A variable point interpolation apparatus with scalable architecture for color correction and a method of the same are disclosed. The color correction apparatus is capable of transforming color image data from a first color space to a second color space and comprises: an appearance equivalent scalable computing means for analyzing the color characteristic of the image data from the first color space and dividing an interpolation input signal of the image data into upper bits and lower bits in which numbers of the upper bits and the lower bits are adjustable; a fuzzy variable point

interpolation computing means
for determining automatically a proper number of
interpolation reference
points; a non-uniform three-dimensional look-up
table, wherein variations of
distances between any two reference values of knot
points in the non-uniform
three-dimensional look-up table are non-uniform.

Brief Summary Text - BSTX (13):

Another aspect of the present invention is using
a **Fuzzy** variable point
interpolating method which quickly quantizes the
color coordinate and
determines the local attribute in **color space for
the data characteristic** of an
input image. The local attribute determines a
built-in appearance tolerance.
Thereafter, the color tolerance factor (C.T.F.) of
the image data can be
determined by membership function. The number of
the closest reference points
being used for interpolation computation can then
be determined in accordance
with the color tolerance factor and the appearance
tolerance.

Detailed Description Text - DETX (24):

Referring to FIG. 9, another preferred
embodiment of the present invention
is capable of establishing different look-up tables
complying with different
correcting rules for different applications. In
this embodiment, **color**
character computing means 310 and **fuzzy** membership
weighting function computing
means 320 are respectively employed instead of the
appearance equivalent

scalable computing means 110 and the **fuzzy** variable point interpolation computing means 120 shown in FIG. 1. The apparatus shown in FIG. 9 further comprises selecting means 330. The other components are the same as shown in FIG. 1. Wherein, the color character computing means 310 can analyze the color character of input image data to decide the dividing ratio of the upper/lower bits. The fuzzy membership weighting function computing means 320 can perform membership function weighting computation according to different correcting rules to determine the number of interpolation points. And the selecting means 330 selects the use of different three-dimensional color look-up tables in accordance with different correcting rules.

Claims Text - CLTX (13):

a **fuzzy** variable point interpolation computing means for receiving the image data from the plurality of buffers, quantizing color coordinates of the image data and determining local attributes of the first **color space according to the color characteristic** of the image data, determining a built-in appearance tolerance by the local attribute, and determining a color tolerance factor of the image data according to membership functions built by an expert system, then determining numbers of reference points needed to perform interpolation computing in accordance with the color tolerance factor and the built-in appearance tolerance;

US-PAT-NO: 6385337

DOCUMENT-IDENTIFIER: US 6385337 B1

TITLE: Method of selecting colors
for pixels within blocks for
block truncation encoding

DATE-ISSUED: May 7, 2002

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	CITY
Klassen; R. Victor			Webster
NY		N/A	N/A

APPL-NO: 09/ 217209

DATE FILED: December 21, 1998

US-CL-CURRENT: 382/166, 382/266

ABSTRACT:

A method and apparatus for selecting colors for blocks for use in a Block truncation Coding scheme is disclosed. The method includes finding the largest cluster of pixels and selecting that color for the first color in the block. The average color of the remaining pixels is assigned to the second color. The invention may be applied in iterative fashion if more than two colors are to be assigned to the block.

6 Claims, 7 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

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Detailed Description Text - DETX (9):

This far the invention has been described, for simplicity, using conventional histogram analysis. In the preferred embodiment, a "fuzzy" histogram is used. In a conventional histogram, values are assigned to "bins", with the counter for a bin being incremented each time a value in the range associated with that bin is encountered. Ranges for the bins are non-overlapping, and together the full set of ranges make up the range of values being histogrammed. In a fuzzy histogram such as used in this invention, values are assigned to all bins within a certain radius. In one dimension, this means that all bins within a given range centered on the value of the current colour would have their counters incremented. Thus if the range is +/-10, and the bin width is 16, a value of 33 would cause the counters for bins 2 and 3 to be incremented, corresponding to ranges 16-31 and 32-47, while a value of 40 would cause the counters for bins 2, 3 and 4, corresponding to ranges 16-31, 32-47, and 48-63, to be incremented.

US-PAT-NO: 6272239

DOCUMENT-IDENTIFIER: US 6272239 B1

See image for Certificate of Correction

TITLE: Digital image color
correction device and method
employing fuzzy logic

DATE-ISSUED: August 7, 2001

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	COUNTRY	CITY
Colla; Federica	N/A	N/A	IT	Crema
Mancuso; Massimo	N/A	N/A	IT	Monza
Poluzzi; Rinaldo	N/A	N/A	IT	Milan

APPL-NO: 09/ 222247

DATE FILED: December 28, 1998

COUNTRY	FOREIGN-APPL-PRIORITY-DATA:
APPL-DATE	APPL-NO
EP	97830730
30, 1997	December

US-CL-CURRENT: 382/167, 362/171

ABSTRACT:

A digital image color correction device and
method employing fuzzy logic,
for correcting a facial tone image portion of a

digital video image is provided. The device is a pixel fuzzifier unit (1) receiving in input a stream of pixels belonging to a sequence of correlated frames of a digital video image and computing a multilevel value representing a membership of each pixel to a skin color class; a global parameter estimator (2) receiving in input each of said pixel and the relative membership value, and computing a first and a second parameter which define the characteristics of a portion of said image that belongs to said skin color class; a processing unit (3) connected downstream to said global parameter estimator and to said pixel fuzzifier unit and adapted to correct each of the pixels of said portion of the image that belongs to said skin color class, according to said first global parameter (300), to obtain corrected pixels; and a processing switch (4) for outputting said pixels or said corrected pixels according to said second global parameter (400).

29 Claims, 9 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

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Detailed Description Text - DETX (10):

First a mean operator is applied on the image and the membership values of each pixels are calculated. To identify the

parameters of the corrections some other membership functions are used. These functions, as shown in FIG. 4, relate to different levels of saturation and value (low, medium and high). Once we have the membership value of each pixel for these fuzzy sets, it is possible to obtain some indexes concerning the degree of and value inside the skin color class.

US-PAT-NO: 6625308

DOCUMENT-IDENTIFIER: US 6625308 B1

TITLE: Fuzzy distinction based
thresholding technique for image
segmentation

DATE-ISSUED: September 23, 2003

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	CITY	COUNTRY
Acharya; Tinku	AZ	N/A	Chandler	N/A
Ray; Ajay K.	N/A	N/A	West Bengal	IN
Rao; A. K. V. Subba	N/A	N/A	West Bengal	IN

APPL-NO: 09/ 393017

DATE FILED: September 10, 1999

PARENT-CASE:

RELATED APPLICATION

This patent application is related to concurrently filed U.S. patent application Ser. No. 09/393,136, entitled, "A FUZZY BASED THRESHOLDING TECHNIQUE FOR IMAGE SEGMENTATION," by Acharya et al., filed on Sep. 10, 1999, assigned to the assignee of the current invention and herein incorporated by reference.

US-CL-CURRENT: 382/168, 382/164 , 382/170 ,
382/171 , 706/8 , 706/900

ABSTRACT:

Embodiments of a fuzzy distinction based thresholding technique for image segmentation are disclosed. In one embodiment, at least one signal value level of the image is determined along which to divide a fuzzy histogram, the histogram being based, at least in part, on the image. The signal value represents a value which produces a divided fuzzy histogram with an extreme value of one of distinctiveness and fuzziness based on a measure of multidimensional distance between measurement distributions and their respective complements. The image is then segmented using the at least one signal value.

30 Claims, 6 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

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Detailed Description Text - DETX (20):

Of course, a variety of segmentation approaches may be employed for color images. For example, where the color space format of the image comprises a three-color plane color space format, such as the YUV color space format of the RGB color space format, a variety of techniques may

be employed, although the invention is not limited in scope to these techniques or to employing color images or three-color plane color space formats. Nonetheless, in one embodiment, a **fuzzy histogram** may be produced for each **color** space, and the pixel signal value employed may be based, at least in part, on all three. Likewise, the color image may be segmented by segmenting all three color space planes of the image. Alternatively, a **fuzzy histogram** may be produced for any one of the **color** space planes or for only a selected one of the **color** space planes, and, again, all three **color** space plane images of the **color** image may be segmented. Of course, additional variations are also possible and within the scope of the present invention. Alternatively, an image may be represented in YUV color space format where the Y component contains luminance signal information about the image. Thus, the previously described embodiment may be applied to the Y component of the image to produce a segmented characterization of the color image.

Patent Assignment Abstract of Title

Total Assignments: 1

Application #: 09737531 **Filing Dt:** 12/13/2000

Patent #: NONE

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Publication #: 20020102018

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Inventors: Siming Lin, Dinesh Nair, Darren Schmidt

Title: System and method for color characterization using fuzzy pixel classification with application in color matching and color match location

Assignment: 1

Reel/Frame: 011422/0286 **Received:** 01/17/2001 **Recorded:** 12/13/2000 **Mailed:** 03/27/2001 **Pages:** 3

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Exec Dt: 11/22/2000

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